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By-Pryor, Donald

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This guide was designed to assist superintendents and school business officials in evaluating and allocating custodial workloads. Part I illustrates a method for equalizing custodial workloads, using a representative employee's performance as a model for measuring the workloads of other employees. The administrator is shown how to select this representative employee, gather the evaluative data, summarize the data, and interpret the results. Part II presents a method (the factoring formula) for determining the proper size of the custodial staff. Factors to be taken into account include the number of rooms, the number of pupils, the floor area, the size of the school grounds, and available equipment. Examples are employed which were taken from an actual study conducted in suburban Minneapolis. (HW)

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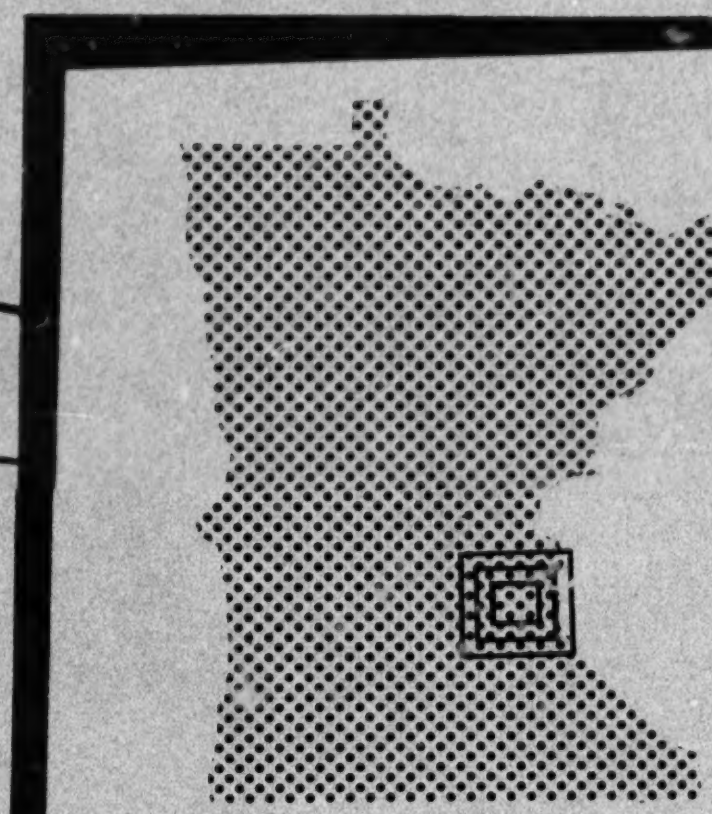

COLLEGE OF EDUCATION
UNIVERSITY OF MINNESOTA
MINNEAPOLIS, MINNESOTA 55455

CUSTODIAL WORKLOAD SURVEYS

(A GUIDE FOR SCHOOL BUSINESS MANAGERS & SUPERINTENDENTS)

EA 001 939

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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CUSTODIAL WORKLOAD SURVEYS

A Guide to Assist School Business Managers and Superintendents

by

Donald Pryor

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INTRODUCTION

Every superintendent of schools and school business manager has had to, at some time, come to grips with the problems involved in evaluating the amount of work done by his custodial force. Often this onerous task is undertaken to satisfy the conscience of the able administrator who knows that without factual information custodial assignments become matters of tradition and the "squeaking wheel" getting attention. Frequently, however, because of the complexity of the task and the amount of time necessary to do the job right it is placed in the "to do" pile and is put off until a crisis erupts or until enough outside pressure is applied to the administrator to force him into action. This force may be a Board of Education diligently searching for a way to hold the line on rapidly rising budgets or, it may be a custodial union loudly proclaiming that their members are overworked and underpaid in the school "sweatshop". Occasionally the impetus may come when friction develops between members of a custodial staff who feel that assignments are not equal and that someone is "getting the best of the deal".

Whatever the source of the pressure is, internal or external, it needs to be relieved promptly and with as little pain as possible. An ounce of prevention being worth a pound of cure it is hoped that the simple, direct and efficient program of workload analysis described in this monograph will encourage responsible administrators to move the task from the "to do" pile to the "completed" pile before any pressures build. There are few better ways for the administrator to enhance his prestige with his board, his staff and his community than to be knowledgeable in this area and have the facts at his fingertips.

FOREWORD

This guide is designed to provide specific assistance to those superintendents and school business officials who are concerned with evaluation of custodial workloads. The efficient allocation of the custodial work force to achieve optimum service requires detailed information. The collection of appropriate data and its analysis demands a logical and orderly procedure for assessing performance as well as task requirements.

Mr. Donald Pryor, Director of Business Affairs, Edina-Morningside Public Schools has completed an extensive investigation of this problem. Since the concepts used and procedures developed are generalizable to school districts in general, the E.R.D.C., with Mr. Pryor's permission is making available this publication to member districts.

It is hoped that the process described herein will assist school personnel in developing a simple and direct program of workload analysis.

Van D. Mueller
Executive Secretary

March, 1967

PART I

EQUALIZING THE WORKLOAD

Selecting the Yardstick

Most formulas used to evaluate the custodial workload are based upon some well conceived but arbitrary, predetermined time standards. Such formulas can at best serve only as a rough guide for an individual school or school district because of the very extreme differences in types of construction, finish materials and acceptable standards of cleanliness that exist from school to school or district to district. Standards developed within a school building or school district are much more realistic and meaningful to those involved.

Self determined time standards need not be difficult to evolve but must always be checked against some recognized standard to insure against the possibility that an error has been made in setting them too high or too low. The total concept which will be developed here provides for locally determined time standards, cross checks and a method of compensating for any error that might have been made in setting the original standards. A word of caution must be interjected at this point, however. Of necessity, this method of evaluation is evolved in several parts. No part will stand alone and the administrator who does not carry the evaluation through its entire process may better have never started for he may find that his conclusions are based on a foundation of sand.

The thesis for self determined standards is quite simple. Select a man (or men) who you feel does a good job, exerts the proper amount of initiative and in general performs his work in a manner entirely satisfactory to you.

This will not be the "best" man on your force because standards such a man would establish would be out of reach for most of the other men. The man selected should preferably represent an area somewhere between "average" and "best".

If the man has an assignment in a building that is representative of the "average" in your district so much the better. In looking for an "average" building consider size, age, quality of construction and finishes and age level of pupils. Some time spent in selection of the proper man (or men) to serve as your model is a good investment as it will give you a feeling of confidence in the final outcome. Any error that is made in selecting a man of too high or too low calibre will become apparent, however, and can be compensated for.

Once the model has been determined carefully time his various tasks. Some preliminary observation and timing without the model's knowledge is desirable to serve as a check against any super effort that he exerts to prove himself once he is acquainted with the project that is underway. The man must eventually be made aware of exactly what his role is in the project. You will need his cooperation and he is bound to discover that "something is going on" anyway. Custodians, like all other humans, fear the unknown much more than the known and once he is fully familiar with your intention he will take justifiable pride in the confidence you have placed in him.

Measure the areas cleaned by the model very carefully. A recheck by a second party is justifiable as errors do occur in measurement that could have great significance. The following items must be determined:

1. The number of square feet of classroom and classroom like space cleaned per minute. (Total area ÷ total time)

2. The number of square feet of corridor space cleaned per minute. (Total area ÷ total time)
3. The time in minutes used to clean a flight of stairs. A flight is the distance from one floor to the next including landings.
4. The number of square feet of kitchen and kitchen like space cleaned per minute. (Total area ÷ total time)
5. The amount of time necessary to clean an auditorium or auditorium like space per 100 capacity. (Total time ÷ total capacity and the quotient multiplied by 100)
6. The number of square feet of locker and shower room space cleaned per minute (Total area ÷ total time).
7. The number of square feet of gymnasium space cleaned per minute (Total area ÷ total time).
8. The length of time it takes to clean a lavatory room expressed in minute per fixture. (Total time ÷ total number of fixtures-- stools, urinals, lavatories). The time used should include time for emptying and replenishing paper, cleaning mirrors, chrome, etc. It was found that the number of fixtures was a more accurate factor than the size of the room.
9. The number of square feet of auxilliary space (office, storage rooms, lounges, etc.) cleaned per minute. (Total area ÷ total time).
10. The time in minutes used for non cleaning duties. (flag duty, light check, heat check, doors locked, additional use of building, etc.)

If no one man does all of these things it will be necessary to use more than one model. The number of models should be kept to the minimum which will supply all of the necessary information for fairly obvious reasons.

The desirability of setting your own standards cannot be stated too strongly. No one else's standards will ever fit your situation as well as the standards you develop under a specific set of conditions. For this reason it is with some misgiving that the standards that were recently determined for one school district are quoted below:

1. Classrooms - 60 sq. ft. per minute
2. Corridors - 200 sq. ft. per minute
3. Stairways - 5 min. per flight
4. Kitchens - 30 sq. ft. per minute
5. Auditorium (fixed seating) - 20 minutes per 100 capacity
6. Locker and shower room - 40 sq. ft. per minute
7. Gymnasium - 200 sq. ft. per minute
8. Lavatories - 4 minutes per fixture

These standards are included to enable you to see if you are within the "ballpark". If you feel you are not, recheck your calculations until you are satisfied that they are correct. Do not yield to the temptation to adopt the quoted standards.

It might help you to know that these standards were developed in a school district where the average age of the buildings is about 8 years. The standard of cleanliness in this district is best described as "sub-hospital". Probably every administrator would describe his buildings as "above average" in cleanliness yet we know from visits to various schools how different these standards can be. By making a comparison with a known outside

standard we are attempting to give a more meaningful description. "Sub-hospital" is the highest standard found in public schools.

Further, the buildings from which these standards were developed have a great deal of terrazzo flooring, the balance being vinyl asbestos flooring or (rarely) asphalt flooring. Walls are natural brick or ceramic tile, doors are formica, toilet bowls and partitions are wall hung, window area is minimal and painted plaster walls are almost non-existent. These are but a few of the variables that may account for some of the differences between the standards you developed and those quoted above.

Gathering the Raw Data

This will be the most time consuming part of the project. The areas cleaned by each man on the custodial staff must be carefully measured. It is not necessary to time each man at each task other than to know the total amount of time he is expected to put in on the job. For the typical eight hour day this would be 465 minutes allowing for a fifteen minute coffee break. This practice may vary somewhat from district to district but the total minutes worked per day is generally fairly constant throughout a given school district.

Not having to time each man at each task accomplishes two things. First, it greatly simplifies data gathering and saves time and, secondly, it allows for individual differences among custodians. Some men may be very efficient at cleaning lavatories while others do better at classrooms or corridors. By eliminating the need for adhering to a strict standard for each task we tend to "average out" the individual differences.

A second look at the task of measurement may show that it is not as formidable as it first appeared. With modern modular construction at least,

if you have measured one classroom you have generally measured them all. Corridors, too, tend to be fairly standard in a given building and other repetitive areas greatly shorten the measuring task. Further, this is a job that can very well be handled by a "head man" or other reliable person on your staff. Nothing should be taken for granted however, and measurements should be taken carefully and at least spot checked for accuracy.

Each man or woman on the custodial force should fill out, completely, a job description such as suggested by Form A. This form incorporates all of the data necessary to complete the evaluation and in addition it will serve to clearly delineate the custodian's job for him. This may very well be the first time he has viewed his work as an integrated package. The form has even further utility in that it can be used with a new or replacement employee to show him exactly what is required to be done in a given position.

All times on the form should be expressed in minutes and has been stated before these do not have to be rechecked. The purpose in including the time data is to enable the supervisor to more quickly pinpoint areas where time is not being used effectively if, when the results are in, it is found that the man is not carrying a full load. The time units also serve as a guide to new or replacement employees and enables them to judge how their work is progressing. The time information supplied by the custodian is not used as the basis of the evaluation. The time units you have formulated from observing your model custodian will be used for this purpose.

After each custodian has completed his job description (Form A) it should be turned in to the lead or head man in the building. The head man should check it for accuracy, especially in the critical measurements of square feet cleaned. When the head man is satisfied that the information is

accurate he should sign his name to the form and send it to the person conducting the study for summarization.

Summarizing the Data

As soon as all job descriptions have been received they should be summarized by building on Form B. It is perhaps wise to summarize your model first to insure that you have all the necessary data. The efficiency of the model must, of course, be 100% by definition. Other custodians will vary up and down from the model. Remember to use the time units you have developed from studying your model and not the times turned in by the custodian. For example, to find the time unit for cleaning classrooms the total area cleaned by a man is divided by the constant number that you have developed from the model. In the samples shown the number is 60.

Time units for each custodian should be added and the sum placed in the "Total Time Units" space. The assigned time is the usual amount of time you expect the man to be working. This should be actual working time and not inclusive of any lunch period or coffee break. For a normal eight hour day with a fifteen minute coffee break the assigned time is 465 minutes. This is the time shown in the examples. A man might, however, have non-custodial assignments such as bus driving, helping in the cafeteria or delivering mail. In such instances the amount of time spent on non-custodial duties is subtracted and the assigned time is something less than 465 minutes. To find the efficiency of the assignment divide total time units for each man by his assigned time. When this has been accomplished for each man in a given building the building summary can be completed. This is done by adding the total time units for each man in the building and dividing by the total time assigned to that building. Building summaries should then be transferred to the Building Comparison sheet, Form C.

CUSTODIAL CLEANING ASSIGNMENT
(Job Description)

Form A

Custodian_____ Building_____

Hours from_____to_____ Total No. Custodians_____

Floor or area_____ Head Custodian_____

CLASSROOMS

Total No. of Classrooms cleaned_____ Av. Size of Classroom_____
Total Sq. Ft. of Classroom space cleaned_____
Approximate time USED TO CLEAN classrooms_____
Room Numbers Describe daily cleaning operations

CORRIDORS

Total Sq. Ft. of corridor area cleaned_____
Approximate time used to clean corridors_____
Corridor floor material_____Condition_____Lockers?_____
Describe daily cleaning operations:

LAVATORIES

Number of Lavatory Rooms cleaned_____

Total Number of Fixtures involved_____

Floor Material_____ Condition_____

Wall Material_____ Condition_____

Approximate time used to clean lavatories_____
Describe daily cleaning operations:

(Continued)

STAIRWAYS

Total number of stairways (one floor to next floor)_____
Approximate time used to clean stairways_____

OTHER AREAS OR SPECIAL DUTIES

Describe Area (A) _____ Total Sq. Ft. _____
Describe Area (B) _____ Total Sq. Ft. _____
Describe Area (C) _____ Total Sq. Ft. _____
Approximate time used to clean other areas_____
Describe daily cleaning operations:

Describe Special Duties:

Approximate time used for special duties_____

CUSTODIAL CLEANING ASSIGNMENT
(Job Description)

Form A

Custodian EXAMPLE MODEL

Building Washington

Hours from 3:00 p.m. to 11:30 p.m.

Total No. Custodians 2

Floor or area North Area

Head Custodian Jack Armstrong

CLASSROOMS

Total No. of Classrooms cleaned 13 Av. Size of Classroom 899
Total Sq. Ft. of Classroom space cleaned 11,687
Approximate time USED TO CLEAN classrooms 234 Min.

Room Numbers	Describe daily cleaning operations
12, 14, 16, 18, 20, 22, 24 26, 28, 30, 32, 34, 36	Move desks, sweep floor, replace desks. Wash sink and counter top. Empty pencil sharpener. Dispose of wastepaper and other refuse. Dust. Weekly Windows and door cleaned. Chalk rail cleaned.

CORRIDORS

Total Sq. Ft. of corridor area cleaned 5,106
Approximate time used to clean corridors 20 min.
Corridor floor material Terrazzo Condition Good Lockers? Yes
Describe daily cleaning operations:

Sweep with yarn broom and sweeping compound. Spot walls, remove gum.

LAVATORIES

Number of Lavatory Rooms cleaned 4

Total Number of Fixtures involved 24

Floor Material Ceramic tile Condition Good

Wall Material Brick and glazed tile Condition Good

Approximate time used to clean lavatories 100
Describe daily cleaning operations:

Toilets are washed with disinfectant and dried with cloth. Urinals cleaned.
Floors mopped. Refill paper and soap.
Weekly - use acid on toilets and urinals to remove iron stain.

(Continued)

STAIRWAYS

Total number of stairways (one floor to next floor) None

Approximate time used to clean stairways _____

OTHER AREAS OR SPECIAL DUTIES

Describe Area (A) Little Theatre Total Sq. Ft. 1,034 - 100 capacity

Describe Area (B) Half of cafeteria kitchen Total Sq. Ft. 650

Describe Area (C) Band room - lounge, etc. Total Sq. Ft. 1,990

Approximate time used to clean other areas 80 min.

Describe daily cleaning operations:

Detail of other areas and cleaning operation on back.

Describe Special Duties: Lock doors, check windows and lights.
Evening use of building by scouts, Y, P.T.A., etc. - put up folding chairs

Approximate time used for special duties 36 min.

CUSTODIAL CLEANING ASSIGNMENT
(Job Description)

Form A

Custodian John Doe

Building Washington

Hours from 3:00 p.m. to 11:30 p.m.

Total No. Custodians 2

Floor or area South End

Head Custodian Jack Armstrong

CLASSROOMS

Total No. of Classrooms cleaned 12 Av. Size of Classroom 899 sq. ft.
Kdgtn 1,580 sq. ft.
Total Sq. Ft. of Classroom space cleaned 13,288
Approximate time USED TO CLEAN classrooms 216 min.

Room Numbers	Describe daily cleaning operations
Kdgtns 1, 2, 3 Rooms 5, 7, 9, 11 6, 8, 10, 38, Library	Clean kindergarten toilet room - 2 fixtures each Move desks, sweep floor, replace desks. Wash counter and sink, empty wastepaper and pencil sharpener. Dust. Weekly Clean windows and door, chalk rails

CORRIDORS

Total Sq. Ft. of corridor area cleaned 5,472
Approximate time used to clean corridors 25
Corridor floor material Terrazzo Condition Good Lockers? No
Describe daily cleaning operations:

Sweep floor with yarn broom and sweeping compound.
Spot walls, remove gum.

LAVATORIES

Number of Lavatory Rooms cleaned 2 (plus kindergarten)

Total Number of Fixtures involved 12

Floor Material Ceramic tile Condition Good

Wall Material Glazed tile Condition Good

Approximate time used to clean lavatories 50 min.
Describe daily cleaning operations:

Same as example model

(Continued)

STAIRWAYS

Total number of stairways (one floor to next floor) None

Approximate time used to clean stairways _____

OTHER AREAS OR SPECIAL DUTIES

Describe Area (A) Gym Total Sq. Ft. 2,840

Describe Area (B) Locker room Total Sq. Ft. 425

Describe Area (C) Office and nurse area Total Sq. Ft. 2,117

Approximate time used to clean other areas 145

Describe daily cleaning operations:

See reverse for detail of other areas and cleaning procedures

Describe Special Duties: Flag, check windows and doors
Help with community meetings

Approximate time used for special duties 36

Summary

CUSTODIAL WORKLOAD SURVEY Form B

School _____

CUSTODIANS / TASKS	Assignment	Time Units	Assignments	Time Units	Assignment	Time Units
Classrooms (No. & Sq. ft.)						
Corridors (Sq. ft.)						
Lavatory Fixtures (No.)						
Stairways (No.)						
Kitchen (Sq. ft.)						
Theatre (Capacity)						
Locker & Showers (Sq. ft.)						
Auxiliary Space (Sq. ft.)						
Gym (Sq. ft.)						
Lock-up & Extra (Min.)						
TOTAL						
Assigned Time						
Efficiency						

BUILDING SUMMARY

Total Time Units _____

Total Assigned Time _____

Efficiency _____

Total Area Cleaned _____ Sq. Ft.

Summary

Form B

CUSTODIAL WORKLOAD SURVEY

School Washington

CUSTODIANS / TASKS	Example Model Assignment	Time Units	John Doe Assignment	Time Units	Assignment	Time Units
Classrooms (No. & Sq. ft.)	(13) 11,687	195	(12) 13,288	221		
Corridors (Sq. ft.)	5,106	26	5,472	27		
Lavatory Fixtures (No.)	32	128	24	96		
Stairways (No.)	none		none			
Kitchen (Sq. ft.)	650	22	650	22		
Theatre (Capacity)	100	20	none			
Locker & Showers (Sq. ft.)	180	5	425	11		
Auxiliary Space (Sq. ft.)	1,990	33	2,622	45		
Gym (Sq. ft.)	none		2,840	14		
Lock-up & Extra (Min.)		36		36		
TOTAL		465		472		
Assigned Time		465		465		
Efficiency		100		101.5		

BUILDING SUMMARY

Total Time Units 937

Total Assigned Time 930

Efficiency 100.76

Total Area Cleaned 45,570 Sq. Ft.

Form C

BUILDING COMPARISON

Building	Time Units	Time Worked	Efficiency
Washington	937	930	100.76
Lincoln	982	930	105.59
Jefferson	373	465	80.22
Adams	836	930	89.89
Kennedy	972	930	104.52
Franklin	1277	1110	115.04
Roosevelt	1740	2025	85.92
Eisenhower	3081	2845	108.30
Johnson	4932	4650	106.06
Total	15,130	14,815	102.13
If one more man was employed:	15,130	15,280	99.02
If one less man was employed:	15,130	14,350	105.44

INTERPRETING THE RESULTS OF Part I

The purpose of the calculations in Part I is to compare the amount of work expected from one man with the amount of work expected from another. We call this the efficiency of assignment. The efficiency of the man in carrying out his assignments is shown only by inference and no attempt is made here to measure the quality of his work. It is assumed that each man does the tasks assigned to him regardless of the size of the assignment. Less than 100% efficiency indicates a workload which is less than that accomplished by your model. More than 100% efficiency indicates a workload which is greater than that accomplished by your model.

The examples that are used in this paper are taken from an actual study that was made in suburban Minneapolis. The names of the schools have been changed to prevent identification and the names of the men are, of course, ficticious. To help you in interpreting the results you have obtained so far let us look at the results obtained from our sample district.

EXAMPLE

Summary of Tine Units and Efficiency of Assignment

Building	Custodian	Time Units	Assigned Time	Efficiency
Washington	Example Model	465	465	100
	John Doe	472	465	101.5
	Building Average	937	930	100.76
Lincoln	A	548	465	117.85
	B	434	465	93.33
	Building Average	982	930	105.59
Jefferson	A	373	465	80.22
Adams	A	468	465	100.64
	B	368	465	79.14
	Building Average	836	930	89.89
Kennedy	A	486	465	104.52
	B	486	465	104.52
	Building Average	972	930	104.52
Franklin	A	525	465	112.9
	B	533	465	114.62
	C	219	180	121.60
	Building Average	1,277	1,110	115.04
Roosevelt	A	465	465	100.0
	B	453	465	97.41
	C	296	315	93.96
	D	314	465	67.52
	E	212	315	67.30
	Building Average	1,740	2,025	85.92
Eisenhower	A	531	315	168.57
	B	431	465	92.68
	C	458	315	145.40
	D	404	465	86.88
	E	126	120	105.00
	F	626	465	134.62
	G	250	465	53.76
	H	255	235	108.51
	Building Average	3,081	2,845	108.30

EXAMPLE (continued)

Building	Custodian	Time Units	Assigned Time	Efficiency
Johnson	A	593	465	127.53
	B	538	465	115.70
	C	232	300	69.67
	D	564	465	121.29
	E	496	465	106.66
	F	465	465	100.0
	G	321	315	101.9
	H	350	465	75.27
	I	509	465	109.46
	J	316	315	100.32
	K	548	465	117.85
	Building Average	4,932	4,650	106.06
	District Average	15,130	14,815	102.13

Several conclusions can be drawn from even casual observation of the data. Basically, the model selected turned out to have a slightly below average assignment rather than the original assumption that he was doing more than the average worker. This is shown by the fact that the average efficiency in the sample district was over 100. Had the example model actually had a larger than average assignment the average efficiency of the district would have been something less than 100. Keep in mind that the purpose of this data is the equalization of workload. It does not matter that the model was slightly misjudged. The basis of equality now becomes 102 rather than 100 as it would have been had we been able to select a perfect model. If you have a great deal of confidence in the model you have selected any sizeable variation from 100, say 5 points or more either way, will tell you something about the relative size of assignments throughout the district. A district wide average of 80 for example would mean that the crew as a whole had assignments only 80% as large as your model. You will learn in Section II how to determine whether assignments on the whole are too large or too small. Here we are chiefly interested in equality among assignments.

Assuming for the moment that the later sections of this study show that the custodial force is exactly the right total size, our immediate goal would be to adjust each man's assignment by adding or deleting duties until everyone came up to the base of 102. This would, of course, automatically equalize the assignments building to building. As a practical matter we will probably find that the total size of the custodial force is not correct and that some adjustment will have to be made to the 102 base. The equalization principles are the same, however, no matter what the base finally turns out to be so we can discuss them at this time.

We have found in our example that there was a variation in size of assignment building to building of this magnitude:

Washington	100.76
Lincoln	105.59
Jefferson	80.22
Adams	89.89
Kennedy	104.52
Franklin	115.04
Roosevelt	85.92
Eisenhower	108.30
Johnson	106.06
Base	102.13

Generally, a deviation of 3 to 5 points is highly acceptable. You are the judge in your particular district, however, and may set your goal with less or greater tolerance if you wish. In the example above we are especially concerned with an excessive load the Franklin school (115) and the relatively "easy" assignments at Adams (90) and Roosevelt (86). Jefferson has a light assignment too but notice that this is a one man school. It will be extremely difficult to reassign this man to another school for the short period of time necessary to bring his efficiency up to 102 without losing as much in travel time as we gain in work. For this reason we will not be too concerned with the Jefferson school and satisfy ourselves that it is inefficient due to its size and there is little we can do about it.

Franklin, Adams and Roosevelt on the other hand are quite easy to adjust. Roosevelt has two men with less than full time assignments (315 min.). Transferring one of these men out of the building leaves a total assigned time

of 1,710 minutes. 1740 ÷ 1710 = 102, our base, and we have corrected this building. Moving this part time man to Franklin in place of the 180 minute man there increases the Adams assignment by 135 minutes (315 - 180 = 135). Adding 135 minutes to Franklin gives them 1,245 assigned minutes and 1277 ÷ 1245 = 102. We have now solved the Franklin problem and now have a three hour (180 min.) man available for reassignment.

By sending this man to Eisenhower, transferring the 120 minute and the 235 minute men from Eisenhower to Adams in trade for the 465 minute man we solve the Adams problem (836 ÷ 820 = 102) and we have improved the Eisenhower situation as an added bonus.

You have seen how the "leap frog" game is played. You may not have the amount of flexibility of assignment that was available in the sample school but by giving one or two men part time assignments in two schools it is amazing how well you can come out with a little work and imagination. The model school achieved its flexibility by using "activity bus drivers," "delivery drivers" and a part time "repair man". Only one man was actually assigned work in two schools.

Equalizing assignments within a given building is simply a matter of reassigning space to be cleaned by each man. In our sample school district the Eisenhower school is an example of how far out of line assignments can get when they are done without a basis in fact. Efficiency of assignment there varied from 53.76% to 168.57%. One man obviously had a "breeze" while the other had more work than anyone could do and had to get by hit and miss cleaning, unsatisfactory to both the custodian and the school district. By using the original job descriptions the head man in the building easily shifted assignments to within an acceptable $\pm$ 5% for his entire crew.

PART II

Determining the Proper Size for the Custodial Staff

The purpose of Part I was to equalize the work assignment of custodians without attempting to determine how large the total staff should be. While this is a very essential part of the study it is probably not the main concern of a Board of Education trying to hold the line on rising budgets. Part II will be devoted to this problem and will be much easier to carry out because most of the necessary information has already been gathered in Part I.

THE FACTORING FORMULA

Just as there are many methods and techniques for measuring work loads per man there are numerous ways in which to approximately establish the optimum total number of custodial employees. None are intended to be infallible measuring devices and all must be tempered somewhat to adjust to the local situation. No attempt will be made here to digest or compare the various methods employed for determining size of staff. The "Factoring Formula" which is the device we will use is a very frequently used yardstick and is the only method which will be discussed.

Perhaps the best description of the factoring formula is found in a booklet entitled "ADMINISTERING THE CUSTODIAL PROGRAM" published by the U. S. Dept. of Health, Education and Welfare in 1961. The following discussion of the factoring formula is quoted from pages 14, 15 and 16 of that booklet:

> "Pattington, contending that methods of computing manpower requirements based on time-motion studies and complicated job analyses covering countless custodial tasks are too time-consuming and produce unlimited combinations, approached the problem from another angle. He considered the overall duties and assignments one custodian should be expected to perform during one day as a unit of measurement."[1]

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[1] M. G. Pattington. "How Many Janitors?" American School Board Journal, 112: May, 1946, P. 49.

"Admitting there will be cases where a maximum or minimum of extra work will make a difference in manpower requirements, Pattington believes that, as a general rule, a formula which takes into account the number of rooms, the number of pupils, the floor area, and the size of school grounds can be used in most cases, if allowances are made for lack of a power lawnmower, a snowplow, a stoker, and outside maintenance help."

"Taking these factors into account, he determined that one custodian could perform satisfactory service in a certain small school containing 11 rooms (including office, cafeteria, and a combination gymnasium-auditorium), having a total floor area of about 15,000 square feet, employing 8 teachers, enrolling 225 pupils, and having about two acres of ground. This school had a power lawnmower, employed a night man for 3 months each winter, secured the services of a woman one afternoon each week for window washing and extra work, and employed extra help for large painting projects during the summer months. In a school of similar size, where snowplow, vacuum cleaner, and stoker were provided, one man did satisfactory work. In both cases, extra help was found necessary to take care of night meetings."

"In larger buildings where labor-saving equipment such as that described above is provided, the standard of one custodian to each 11 rooms, or to each 8 teachers, or to each 225 pupils, or to each 15,000 square feet of floor area, or to each two acres of school grounds, when used in combination to obtain an average, seems to provide a satisfactory minimum manpower for custodial services."

"For example, in a large school of 80 rooms containing 135,CCO square feet of floor space, employing 64 teachers, having an enrollment of 1,700 pupils, and occupying a site of 12 acres, the custodial requirements would be determined as follows:

1. 80 rooms divided by 11 equals - - - - - - - - 7.3 custodians
2. 64 teachers divided by 8 equals - - - - - - - 8.0 custodians
3. 1,700 pupils divided by 225 equals - - - - 7.6 custodians
4. 135,000 square feet divided by 15,000 equals 9.0 custodians
5. 12 acres divided by 2 equals - - - - - - - - 6.0 custodians
6. Add these five quotients - - - - - - - - - -37.9
7. Dividing this total by 5, the number of factors will result in a quotient of 7.6 which will be the number of custodians needed for the building."

"However, if hand-firing of furnaces is necessary in a large school, it is suggested that an extra man should be added, with an additional part-time man for winter months; and in smaller schools a night man for the winter months is suggested.

"Berry,[2] reporting for the Northern California Section Maintenance Committee of the California Association of Public School Business Officials, stated that an approach using a "factoring formula" to compensate for variables found in individual schools should be considered in determining custodial requirements for normal cleaning duties."

"Except for some refinements, the formula developed by this committee is esentially the same as the one developed by Pattington."

"Berry illustrates the application of the "factoring formula" as follows:

1. Given: 1 custodian for each 8 teachers, find the teacher factor.

$$\frac{\text{Number of teachers}}{8} = \text{Teacher factor (correct to two decimal places)}$$

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[2]Edwin G. Berry. "Custodial Work Load Formula." The Nation's Schools, 56: PP. 84-86, July 1955.

2. Given: 1 custodian for each 225 pupils, find the pupil factor.

$$\frac{\text{Number of pupils}}{225} = \text{Pupil factor (correct to two decimal places)}$$

3. Given: 1 custodian for every 11 rooms* to be cleaned, find the room factor.

$$\frac{\text{Number of rooms}}{11} = \text{Room factor (correct to two decimal places)}$$

4. Given: 1 custodian for every 15,000 square feet of building area, find the square foot factor.

$$\frac{\text{Total square feet of building}}{15{,}000} = \text{Square foot factor (correct to two decimal places)}$$

5. Given: 1 custodian for each 2 acres of upkept grounds, find the grounds factor.

$$\frac{\text{Total acres of upkept grounds}}{2} = \text{Grounds factor (correct to two decimal places)}$$

6. Add the five factors and divide the total by 5 to find the actual number of cleaning custodians needed.

$$\frac{\text{Total of 5 Factors}}{5} = \text{Cleaning custodians needed (correct to two decimal places)}^{**}$$

* All rooms to be cleaned by custodians are included: offices, storage rooms, toilets, classrooms, gymnasiums, etc. An average classroom was defined as one containing 1,000 square feet. This standard is used to break large area rooms, such as gymnasiums and multi-use rooms into equilvalent classrooms.

** End of Quotation from ADMINISTERING THE CUSTODIAL PROGRAM

While the factoring formula is, in our opinion, the most satisfactory of the popular measuring devices in use today it does have its limitations.

Perhaps the most obvious of its shortcomings is its lack of differentiation between elementary and secondary schools. It is our feeling that the formula is quite appropriate for elementary schools. Secondary schools do present some unique problems that are not considered in the formula. For example, secondary facilities are often used very extensively outside of the school day. A few of the most frequent users of out of school time are:

1. Parties and dances (including Teen Center)
2. Auditorium programs
3. Community Theatre
4. Adult Education
5. Use of gymnasiums by Community Athletic Groups
6. Dinner meetings, banquets

In addition the athletic facilities in secondary schools, particularly with highly developed programs such as are found in suburban schools, add considerably to the custodial workload. Swimming pools and hockey rinks would be two examples of very high maintenance facilities that should no doubt be considered outside of the formula. We estimate, for example, that the total time used to maintain a swimming pool is equivalent to half of one custodial assignment.

Because of these conditions that are unique to secondary schools and especially to secondary schools with highly developed athletic and community facilities we feel that some addition must be made to the manpower allocation determined by the factoring formula. What the exact amount of extra time should be for each building is somewhat intangible.

We feel that the assignment of one half an additional man at each Jr. High and one additional man at each Sr. High is justifiable. We, therefore, suggest this additional manpower over and above what the factoring formula indicates.

It will be necessary for you to complete a factoring formula worksheet such as Form D for each of your school buildings. You already have the data for the number of rooms and number of square feet from Part I. The new information you will need is the number of teachers and pupils in each building together with an estimate of the area of the grounds.

After you have completed a factoring worksheet for each building the results should be summarized as shown in Form E which, again, is the actual result from the subject school system.

FORM D

FACTORING FORMULA WORKSHEET

WASHINGTON ELEMENTARY SCHOOL

	FACTOR	FRACTION	DECIMAL EQUIVALENT
1.	Teachers	$\frac{27}{8}$	3.375
2.	Pupils	$\frac{768}{225}$	3.413
3.	Rooms (900 sq. ft.)	$\frac{54,387}{11}$	4.944
4.	Square Feet	$\frac{48,944}{15,000}$	3.263
5.	Grounds	$\frac{8}{2}$	4.000

Total = 5

$\frac{\text{Total}}{5}$ = Manpower Needed

MANPOWER ASSIGNED TO BUILDING

Headman (Days)	1.00
Night Men	2.00
Bus Drivers 3 = $\frac{540}{465}$ =	1.16
Total	4.16

SUMMARY FORM E

CUSTODIAL MANPOWER COMPARED TO ALLOCATION BY FACTORING FORMULA

	Factoring Formula Assignment	Men Assigned to Building	Assigned To Non-Custodial Tasks
Washington	3.8	4.1	0
Lincoln	4.0	4.0	0
Jefferson	1.6	2.0	0
Adams	3.7	4.3	0
Kennedy	4.2	4.3	0
Franklin	4.3	4.6	0
Roosevelt Jr. High	6.8 + .5* = 7.3	8.0	1.0 a
Eisenhower Jr. High	12.4 + .5* = 12.9	10.8	.74 a
Johnson Sr. High	15.3 + 1.0* = 16.3	16.3	1.0 b
Total	56.1 + 2* = 58.1	58.6	2.74

a. Assigned to Laundry

b. Assigned to Cafeteria

*Additional Recommended for Secondary Schools

If the results of the factoring formula and the efficiency of assignment reinforce each other you will no doubt have considerable confidence in their findings. This would be especially true if you are completely satisfied with your custodial model. The two parts reinforce each other if:

1. Efficiency is 100 or over and the factoring formula shows that you have the correct number of men or fewer men than indicated by the formula.
2. Efficiency is less than 100 and the factoring formula shows that you have too many men on your staff.

In the event that the results do not reinforce each other, or do not substantiate your belief in your model, you may well want to check the factoring formula against another standard in order to gain confidence in one result or the other. A very simple standard was provided in SCHOOL MANAGEMENT for January, 1966, page 134. This is what the magazine has to say on the subject:

> "The median district in the United States has 6.02 custodians for every 1,000 students. Because custodians are so often called upon to perform both maintenance and operations functions, they've been combined into one grouping to provide this figure. Twenty-five percent of the nation's districts (and this is probably a good measure of quality), hire 7.40 custodians for every 1,000 students; the Top Tenth hire 9.06."

A simple division of total enrollment by the total size of your maintenance and custodial force will give you a rough basis of comparison. If the resulting quotient is around 6 you equal the median for the U. S. If it is around 7.5 you are in the top 25% which the magazine indicates is a good measure of quality. Anything below 6 or above 8 would, in our opinion, indicate a need for action.

INTERPRETING THE RESULTS OF PART II

The results of the factoring formula are a good deal easier to interpret than were those of equalizing the workload. Adjustment to the indicated level may be a good deal more difficult to achieve, however, since it may either entail laying off men which will probably be strenuously resisted by the custodial force or it may necessitate hiring additional men which may not be popular with the Board of Education or the residents of the school district. In either event you will be able to make judgements and take action based on facts and acceptable standards. This is a much better position than most school districts find themselves in when trying to make these important decisions.

The results you obtained from the factoring formula will not, in all probability, be as close to the ideal as was the case in the subject school. There the formula indicated 58.1 men were needed while the school had 58.6 employed or 1/2 man above the formula. Normally no action needs to be taken if you are less than one man either way from the standard. The action to be taken for larger deviations than this will depend largely on the local situation. If, for example, the formula indicates you need more men and yet you are completely satisfied that you buildings are being maintained in exactly the way you want them you will probably not hire the additional men. You should be sure, however, that you are not actually postponing maintenance problems to some future date by what is on the surface adequate care at the moment.

On the other hand, if the formula indicates that you have too many men it might be better to wait for retirements, resignations, or an expansion

of facilities to bring your staff within acceptable limits rather than to lay off employees. A frank discussion with your staff in the event that you chose this course of action can do nothing but enhance your prestige with the men. When they know that you are concerned about their jobs, their families and their happiness they may respond in a way that will make this whole effort worthwhile.

ADJUSTING THE AVERAGE EFFICIENCY OF ASSIGNMENTS

When you have finished with the factoring formula one further calculation is necessary to make the study complete. Based on your findings from the factoring formula adjustment must be made to the efficiency base for Part I. Three examples using the data in the study will illustrate this adjustment.

Example I

58.6 men employed - factoring formula indicates 55 men should suffice.

$$\frac{58.6}{55} \times 102 \text{ (original base)} = 108.5$$

108.5 should be new efficiency base. If all men are assigned to this figure staff can be reduced 3.6 men to meet factoring formula standard.

Example II

58.6 employed - factoring formula indicates 58.6 should suffice.

$$\frac{58.6}{58.6} \times 102 \text{ (original base)} = 102.$$

No change necessary in original base. If all men are assigned to this figure present staff will meet factoring formula standard.

Example III

58.6 employed - factoring formula indicates 62 should be employed.

$$\frac{58.6}{62} \times 102 \text{ (original base)} = 95.4$$

If all men are assigned to this figure 3.4 men will have to be employed to meet the factoring formula standard.

With this adjustment you can see that any error that was made in selecting the original subject upon which to build your standards is compensated for. Nevertheless, as we have said before, reasonable care in selecting this person will give you a sense of confidence in the outcome which in your opinion may even outweigh the arbitrary standards that are developed in Part II.

You now have the forms and technique with which to tackle this important undertaking. All that remains is to move it from the "To Do" to the "Done" pile on your desk. Good Luck!

PUBLICATIONS OF THE COUNCIL

The following Council publications, listed first by topic area and then by date of publication, are available to Council members and other interested persons at a nominal charge.

I. COUNCIL INFORMATION AND ORGANIZATION

Guidelines for Organizing and Operating Local Research and Development Committees, October, 1964.

Final Progress Report (November 1, 1963 to October 31, 1964) for the Louis W. and Maud Hill Family Foundation, November, 1964.

Organizational and Operations Manual, Revised 1966.

Educational Research and Development Council of the Twin Cities (An information pamphlet).

E.R.D.C. Membership Directory, 1968-69.

E.R.D.C. Annual Report, 1965-1966 Year; 1966-1967 Year; and 1967-1968 Year.

Annual Meeting, School Study Councils, "Functional Relationships Among State Departments of Education, United States Office of Education, Title III Centers and School Study Councils," April, 1968.

II. FINANCE STUDIES

The History of School Expenditures in the Twin Cities Metropolitan Area. Survey of Expenditures from 1947-48 through 1962-63, June, 1964.

Municipal Overburden. A Special Preliminary Report to School Districts of the Educational Research and Development Council of the Twin Cities Metropolitan Area, Inc., Van D. Mueller. April, 1965; new revised report, June, 1966.

A Report on Economic Factors Affecting Teachers' Salaries in the Twin Cities Metropolitan Area, January, 1967.

A Study of the Cost of Fringe Benefits for Minnesota Public School Personnel, 1965-66, Warren V. Nelson, September, 1967.

A Study of the Operating and Maintenance Costs in a Suburban School District, John Mauge and Gary Mohrenweiser, January, 1968.

Financing Schools in the Twin Cities Metropolitan Area. An Analysis Actual Revenues and Expenditures for the School Year 1962-1963; for the School Year 1963-1964; for the School Year 1964-1965; for the School Year 1965-1966; for the School Year 1966-1967; for the School Year 1967-1968.

COUNCIL PUBLICATIONS (Cont.)

III. STAFFING STUDIES

Administrative Staffing Practices in Council Schools, Arland W. Otte, July, 1965.

Custodial Workload Surveys, A Guide to Assist School Business Managers and Superintendents, Donald Pryor, March, 1967.

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*Organizational Climate of Elementary Schools, Research Monograph No. 2, "Identifying and Classifying Organizational Climates in Twin Cities Area Elementary Schools," Robert J. Brown, April, 1965.

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*Organizational Climate of High Schools, Research Monograph No. 4, "A Study of Principal and Staff Perceptions of High School Organizational Climate," James C. Sargent, June, 1967.

*Inside the Organization Teacher, "The Relationship Between Selected Characteristics of Teachers and Their Membership in Teacher Organizations," Otis A. Brinkmeier, Gerald C. Ubben, and Richard C. Williams, June, 1967.

*Factors Influencing Catholic High School Enrollment, D. A. Porter, September, 1967.

*First-Line Supervision in the Public Schools, Special Monograph No. 5, Geraldine Evans, 1968.

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V. ESEA TITLE III PROJECT PROPOSALS

Total Information for Educational Systems (TIES), January, 1967.

Teacher Inservice and Community Education Project in Family Life and Sex Education Via Educational Television, June, 1967.

Cooperation for Health in Individual Life Development (Project Child), June, 1967.

VI. EDUCATIONAL ADMINISTRATION PUBLICATIONS

Educational Implications of Research on Productive Thinking. A. Harry Passow, February, 1965.

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Recruitment Procedures. Neal C. Nickerson, Jr., July, 1965.

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Creative Leadership in the Secondary School. Sister Mary Theresia Spellman, June, 1966.

Corporal Punishment. Gene E. McAllister, July, 1966.

Elementary School Admission Policies. Robert W. Savage, November, 1966.

I. The High School Principal as a Supervisor and Educational Leader During the Next Decade. Owen Hallean, together with II. The Role of Classroom Visitation by the Secondary School Principal in Supervision of Teachers. Gene Hamilton, October, 1966.

VII. CURRICULUM AND INSTRUCTION PUBLICATIONS

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VIII. WORKSHOP REPORTS

Evaluation Project, Pilot In-Service Simulation Workshop for Secondary School Principals of the Educational Research and Development Council, September, 1964.

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X. SPECIAL TOPICS

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Educational Philosophy Makes a Difference, Dale A. Johnson, August, 1967.

The Adolescent Diabetic: Some Personality and Knowledge Characteristics and Their Implications for Education, Roy B. Collier, Jr., September, 1967.

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